Conclusions. Telmisartan monotherapy resulting in LV mass reduction is associated with a significant improvement of diastolic filling parameters and with a significant reduction of left atrial volumes.

1065-49 Effect of Age on the Response of Transmitral Filling Velocities to the Valsalva Maneuver in Healthy Subjects: A Population-Based Study

Vijaya K. Munagala, Steven J. Jacobsen, Douglas Mahoney, Richard J. Rodeheffer, Kent R. Bailey, Margaret M. Redfield, Mayo Clinic and Foundation, Rochester, MN

Background: The response of the ratio of the early/late transmitral flow velocities (E/A) to Valsalva is used to differentiate normal and pseudo-normal patterns. Various criteria for an abnormal response have been used including peak Valsalva E/A (E/A_{VAL}) < 1.0 ("E/A reversal') or Δ in E/A with Valsalva ($\Delta E/A_{VAL}$) ≥0.5. Some studies correct for E - A fusion with Valsalva by using the change in E/(A - E@A) (Δ E/A_{VAL} corr). We sought to define the E/A response to Valsalva in healthy subjects and determine its association with age.

Methods: 2042 randomly selected residents of Olmsted, MN ≥ 45 years underwent Doppler Echocardiography and medical record review. Subjects without a history of cardiovascular disease or diabetes and with normal systolic and valvular function by 2-D echo comprised the study group (n=1006). Valsalva maneuver was possible in 810 subjects.

Results: E/A_{VAL} correlated strongly with age while the correlation with age was weak for $\Delta E/A_{VAL}$ and $\Delta E/A_{VAL}$corr. Of those subjects with a baseline E/A≥1.0 (n=640), the E/A_{VAL} was < 1.0 in 328 (51%) and of these, $\Delta E/A_{VAL}$ was ≥ 0.5 in 145 while the $\Delta E/A_{VAL}$ corr was ≥ 0.5 in 62. Only 19 subjects had other definitive Doppler evidence of a psuedo-normal pattern.

Conclusion: Age related changes in E/A_{VAL} result in a high % of clinically and echocardiographically normal subjects with "E/A reversal' in response to Valsalva. These data discourage the use of "E/A reversal' alone to establish pseudo-normal pattern and sugest that the use of $\Delta E/A_{VAL}$corr may be more specific.

Age groups	45-49	50-54	55-59	60-64	65-69	70 & above	*P* value (Corr. Co-eff)
Number	152	195	150	113	91	109	
Baseline E/A	1.40 (0.36)	1.27 (0.37)	1.19 (0.32)	1.09 (0.29)	0.98 (0.26)	0.89 (0.23)	<0.0001 (-0.48)
E/A_{VAL}	0.99 (0.25)	0.89 (0.21)	0.82 (0.25)	0.75 (0.24)	0.65 (0.22)	0.59 (0.22)	<0.0001 (-0.54)
$E/(A-E@A)_{VAL}$	1.51 (0.77)	1.37 (0.77)	1.21 (0.68)	1.05 (0.47)	0.88 (0.39)	0.79 (0.53)	<0.0001 (-0.50)
$\Delta E/A_{VAL}$	0.43 (0.34)	0.41 (0.32)	0.44 (0.56)	0.38 (0.27)	0.32 (0.22)	0.29 (0.23)	0.0005 (-0.12)
$\Delta E/(A-E@A)_{VAL}$	-0.09 (0.83)	-0.07 (0.80)	0.05 (0.82)	0.07 (0.47)	0.09 (0.36)	0.09 (0.50)	0.0324 (0.07)

1065-50 Heart Rate Response to Valsalva Maneuver as a Predictor of Left Ventricular Filling Pressure

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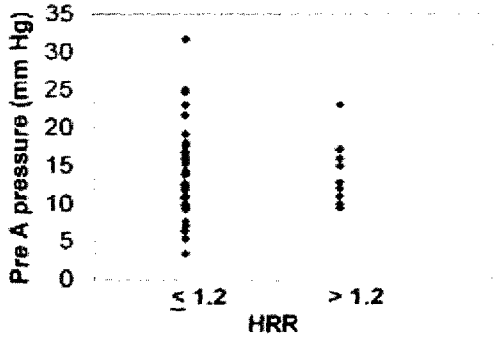
Background: The mitral inflow velocity curve has been used to determine diastolic filling of the left ventricle (LV). At times, this requires differentiation of the "pseudonormal' pattern from the normal pattern. The change in mitral inflow during the Valsalva maneuver has been proposed as a method to differentiate these patterns, but if tachycardia occurs during the strain phase of the maneuver, there is E and A fusion that renders the mitral inflow unanalyzable. We hypothesized that the presence of tachycardia itself during the Valsalva maneuver is a marker of normal diastolic filling pressures.

Methods: Patients undergoing left heart catheterization performed the Valsalva maneuver. We measured the R-R intervals during the 4 phases of the maneuver and compared the results to the pre-A wave LV diastolic pressure.

Results: Sixty consecutive patients (23 women) in sinus rhythm, mean age 65 years, were enrolled. The heart rate ratio (HRR) was calculated from the R-R interval of phase 4 (minimum heart rate) divided by the R-R interval of phase 3 (maximum heart rate). The HRR > 1.2 had a specificity of 84% for pre-A < 15 mm Hg, and a specificity of 83% for pre-A < 20 mm Hg. Ninety percent of patients with a HRR > 1.2 had pre-A < 20 mm Hg.



Conclusion : An increase in the heart rate during the Valsalva maneuver can be a reliable marker for ruling out moderate-severely elevated LV filling pressures. The assessment of diastolic filling during maneuvers should include both the mitral inflow velocity response and the heart rate response.

POSTER SESSION

1066 Novel Applications of Ultrasound With Stress

Sunday, March 30, 2003, 3:00 p.m.-5:00 p.m.
McCormick Place, Hall A
Presentation Hour: 4:00 p.m.-5:00 p.m.

1066-31 Doppler Stress Pulmonary Hemodynamics in Mild to Moderate Pulmonary Hypertension

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Background: Pulmonary artery systolic pressure (PASP) response to exercise in normal subjects has been previously described. The aim of this study is to assess the PASP response to exercise in patients (pts) with mild to moderate pulmonary hypertension and to investigate its relationship to resting PASP, age, sex, symptoms, and systemic blood pressure (SBP). Methods: Doppler stress echocardiogram was performed using standardized supine bicycle exercise in 78 subjects (age =49 +/- 11 yrs, M/F=22/56). Of those, 39 were normal volunteers with resting PASP ≤ 30 mmHg and 39 pts had resting PASP between 31 and 54 mm Hg. All 78 had an otherwise normal rest echocardiogram,and no history of significant lung disease. PASP was determined from tricuspid regurgitation velocity (assuming a right atrial pressure of 5 mmHg). PASP, cardiac index, and SBP were measured at each stage of exercise. Results: The rate of increase in PASP with exercise was positively associated with the PASP at rest (P<0.0001), age, and female sex. For every 10 mmHg higher PASP at rest, PASP slope increased by 0.9 mmHg / minute. After adjusting for age, sex, SBP, and presence of dyspnea by multivariate analysis, PASP slope was still independently related (p=0.046) to resting PASP. PASP was inversely associated with decreased exercise time (P<0.0001); an increase of 1 mmHg/minute in PASP slope was associated with 1.26 minutes reduction in exercise time. Conclusion: The PASP response to exercise is exaggerated in individuals with mild to moderate elevation in PASP at rest. PASP slope is a strong independent predictor of decreased exercise time. This exaggerated increase in PASP with exercise may explain the shorter exercise duration and dyspnea in pts with mild to moderate resting pulmonary hypertension.

1066-32 Noninvasive Estimation of Left Ventricular End-Systolic Elastance During Stress Echocardiography in Patients With Severe Mitral Regurgitation Predicts Latent Left Ventricular Dysfunction

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Background: The optimal timing of surgery for patients with severe mitral regurgitation (MR) is before the development of significant LV systolic dysfunction. Reduced afterload in these patients may result in a normal ejection fraction (EF) despite abnormal LV contractility. Exercise echo can reveal limited contractile reserve in such patients. End-systolic elastance (E_{es}), the slope of the end-systolic pressure-volume relation, provides a more load independent means of assessing LV contractiiity. We hypothesize that a new non-invasive method of estimating E_{es} may help detect latent LV dysfunction during exercise and help predict those at risk of LV dysfunction post repair.

Methods: Forty-six patients with severe MR and normal EF (54 +/- 14yrs; 29 male; 42 NYHA class I), underwent exercise echo between Jan 2001 and Mar 2002. E_{es} was estimated using the following: $E_{es} = [P_d - (E_{Nd} \times P_s \times 0.9)] / (SV \times E_{Nd})$. P_s and P_d = systolic and diastolic arm cuff pressures; SV = echo-Doppler stroke volume and E_{Nd} = estimated normalized elastance at onset of ejection based on noninvasive measure of EF and arterial load (ratio of P_d / P_s). All subsequently had successful MV repair.

Results: Ejection fraction post valve repair, at a median of 4 days, was significantly reduced compared to the preoperative EF at rest and peak stress. End systolic elastance increased significantly from rest to peak exercise.(E_{es} increased from 2.26 +/- 0.6 mmHg/ml to 2.82 +/- 0.8 mmHg/ml (p = 0.01). EF post repair correlated best with E_{es} at peak exercise (r = 0.7; p < 0.001) with only moderate correlations with EF at rest (r = 0.46; p = 0.01) and peak stress (r = 0.38; p = 0.04) and E_{es} at rest (r = 0.48; p = 0.005).

Conclusion: Non-invasive estimation of E_{es} may help to reveal latent LV contractile dysfunction during exercise echo in patients with severe MR and normal EF. In asymptomatic patients, this index may help determine optimal timing of surgical repair.

1066-33 Change in Doppler Left Ventricular Inflow Pattern by Leg Lifting Maneuver Unmasks Diastolic Dysfunction in Hypertensive Patients With Diabetes

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Background: Left ventricular (LV) diastolic dysfunction in hypertensive and diabetic patients occasionally causes heart failure without systolic dysfunction (diastolic failure). However, it is difficult to detect the latent diastolic failure at a steady state. So, we tried to disclose this latent dysfunction in these patients, by performing a simple test that